layer **1642**, the insulated electrode layer **1662** must be divided into several relatively small electrically floating sections, so as not to interfere with the underlying touch-sensitive layer **1642**, which is typically based on capacitive detection.

[0095] The embodiment **1600**A shown in FIG. **16**A provides the benefit that the insulated electrode layer **1662** resides underneath the touch-sensitive layer **1642** and cannot interfere with its operation. On the other hand, the embodiment **1600**B shown in FIG. **16**B more easily lends itself to upgrade devices for pre-existing touch-sensitive displays.

[0096] In some implementations, it is beneficial to provide a floating energy feed and signalling interface to the touch input section of the interface apparatus. Benefits of the floating coupling include the possibility to share elements between the touch-sensitive layer **1642** and the insulated electrode layer **1662**. For instance, a conductive film may act as both the touch-sensitive layer **1642** and the insulated electrode layer **1662**. The tactile output controller **1660** may be isolated from the bus **1602**, wherein the isolation is applied to both energy feed and signalling. Energy feed to the tactile output controller **1660** may be inductive or capacitive, for example. Optical isolation may be used for signalling. This makes it possible to use the touch-sensitive layer **1642**, together with its control electronics, also as the insulated electrode layer **1662**. The insulation for the floating coupling can be installed on either side of the touch input controller **1640**.

[0097] One specific implementation involves creating a patterned structure on top of capacitive sensing area. The patterned structure has areas of different conductivity. When the topmost electrosensory layer is not charged to a high voltage for usage as a tactile output, it provides a spatial distribution of conductivity to an underlying capacitive detector or a grid of capacitive detectors which respond to variations of the capacitive coupling between the user's finger and the capacitive sensing area as the user's finger approaches or touches various positions of the sensing area. Such a grid for capacitive sensing may be called a projected capacitive screen. The capacitive detectors are operated at a relatively high frequency compared to the capacitive output system. The input devices typically operate using frequencies from several kilohertz to several megahertz, while the capacitive electrosensory output system operates at a frequency between a few dozes and a few hundred Hertz. Thus the capacitive input is able to detect the location of the touching body member. When the tactile output is used in the low frequency range, the top layer becomes approximately evenly charged and provides the electrosensory tactile output. In the case of a touch screen, the conductive areas can be made of indium tin oxide (ITO), for example, and the less conductive areas can be made of either thinner, less conductive, ITO or a semiconductive transparent polymer, for example.

[0098] Grounding of the interface apparatus and its user was studied in connection with FIGS. **10** through **13** by means of equivalent diagrams. As regards practical implementation, grounding may be of capacitive or galvanic (resistive or semiconductive) in nature. Capacitive grounding isolates direct current while the other forms of grounding conduct direct current at least to some degree. While galvanic grounding, ie, grounding via negligible resistance, is functionally good, in some circumstances it may be uncomfortable to the user because of intensive static discharges. In an implementation with multiple individually controlled electrodes, a ground reference for an electrode may be provided by its neighbour electrodes.

[0099] It is readily apparent to a person skilled in the art that, as the technology advances, the inventive concept can be implemented in various ways. The invention and its embodiments are not limited to the examples described above but may vary within the scope of the claims.

REFERENCES

[0100] 1. Yamamoto, A. et al., "Electrostatic Tactile Display with Thin Film Slider and Its Application to Tactile Telepresentation Systems", IEEE Transactions on Visualization and Computer Graphics, Vol. 12, Issue 2, March-April 2006, p. 168-177.

[0101] 2. Gunther, Eric: "Skinscape: A Tool for Composition in the Tactile Modality" Master's thesis, Massachusetts Institute of Technology 2001, available on the Internet at address:
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1-13. (canceled)

14. Apparatus comprising:

a touch surface configured to be touched by a body member;

a detection circuitry configured to detect a presence or absence of the body member on the touch surface at a position on the touch surface;

at least one electrode;

a power source to provide power to the at least one electrode;

an insulation layer to form at least part of a capacitive coupling between the at least one electrode and the body member to produce an electrosensory sensation to the body member, the insulation layer to inhibit a flow of direct current between the at least one electrode and the body member; and

a controller configured to vary the power applied to the at least one electrode based on detection of the presence or the absence of the body member at the position so as to vary the electrosensory sensation.

15. The apparatus of claim **14**, comprising a plurality of touch sensitive areas each having an associated position, the controller being configured to individually vary the electrosensory sensation in each touch sensitive area.

16. The apparatus of claim **15**, wherein the plurality of touch sensitive areas are separated by a grid.

17. The apparatus of claim **15**, comprising a plurality of electrodes, each electrode being associated with a touch sensitive area.

18. The apparatus of claim **17**, wherein the detection circuitry is configured to detect a simultaneous touching at multiple touch sensitive areas, and the controller provides a different electrosensory stimulation in each of the multiple touch sensitive areas.

19. The apparatus of claim **14**, comprising a touch input section including the touch surface and the detection circuitry, and a tactile output section including the at least one electrode, the touch input section and the tactile output section sharing a conductive layer.

20. The apparatus of claim **14**, wherein the touch surface is part of a touch sensitive display, the at least one electrode being integrated within the touch sensitive display to allow the electrosensory sensation to the body member touching the touch sensitive display.